KEY

Mole Calculation Practice Worksheet

Answer the following questions:

1) How many moles are in 25 grams of water?

2) How many grams are in 4.5 moles of Li_2O?

3) How many molecules are in 23 moles of oxygen?

4) How many moles are in 3.4×10^{23} molecules of H_2SO_4?

5) How many molecules are in 25 grams of NH_3?

6) How many grams are in 8.2×10^{22} molecules of N_2I_6?

Mole Calculation Practice Worksheet

Answer the following questions:

1) How many moles are in 25 grams of water?

$$25\text{g } H_2O \times \frac{1\text{mol}}{18\text{g } H_2O} = 1.4\text{ mols } H_2O$$

2) How many grams are in 4.5 moles of Li_2O?

$$4.5\text{mol } Li_2O \times \frac{29.88\text{g}}{1\text{mol}} = 134\text{g } Li_2O$$

3) How many molecules are in 23 moles of oxygen?

$$23\text{mol } O_2 \times \frac{6.02\times10^{23} O_2}{1\text{mol } O_2} = 1.4\times10^{25}\text{ mol } O_2$$

4) How many moles are in 3.4×10^{23} molecules of H_2SO_4?

$$3.4\times10^{23} H_2SO_4 \times \frac{1\text{mol}}{6.02\times10^{23} H_2SO_4} = 0.56\text{ mol } H_2SO_4$$

5) How many molecules are in 25 grams of NH_3?

$$25\text{g } NH_3 \times \frac{1\text{mol}}{17\text{g } NH_3} \times \frac{6.02\times10^{23} NH_3}{1\text{mol}} = 8.9\times10^{23} NH_3$$

6) How many grams are in 8.2×10^{22} molecules of N_2I_6?

$$8.2\times10^{22} N_2I_6 \times \frac{1\text{mol } N_2I_6}{6.02\times10^{23}} \times \frac{789.4\text{g}}{1\text{mol } N_2I_6} = 107.5\text{g } N_2I_6$$

Moles Worksheet

1) Define "mole".

2) How many moles are present in 34 grams of $Cu(OH)_2$?

3) How many moles are present in 2.45×10^{23} molecules of CH_4?

4) How many grams are there in 3.4×10^{24} molecules of NH_3?

5) How much does 4.2 moles of $Ca(NO_3)_2$ weigh?

6) What is the molar mass of MgO?

7) How are the terms "molar mass" and "atomic mass" different from one another?

8) Which is a better unit for expressing molar mass, "amu" or "grams/mole"?

Moles Worksheet

1) Define "mole". 6.02×10^{23} of any thing!

2) How many moles are present in 34 grams of $Cu(OH)_2$?

$34\,g\,Cu(OH)_2 \times \frac{1\,mol\,Cu(OH)_2}{97.55\,g} = 0.35\,mol\,Cu(OH)_2$

ions molecules F.U.

3) How many moles are present in 2.45×10^{23} molecules of CH_4?

$2.45 \times 10^{23}\,CH_4 \times \frac{1\,mol\,CH_4}{6.02 \times 10^{23}\,molec} = 0.41\,mol\,CH_4$

4) How many grams are there in 3.4×10^{24} molecules of NH_3?

$3.4 \times 10^{24}\,NH_3 \times \frac{1\,mol\,NH_3}{6.02 \times 10^{23}\,molec} \times \frac{17\,g}{1\,mol\,NH_3} =$

5) How much does 4.2 moles of $Ca(NO_3)_2$ weigh?

$4.2\,mol\,Ca(NO_3)_2 \times \frac{164\,g}{1\,mol\,Ca(NO_3)_2} = 689\,g\,Ca(NO_3)_2$

$96\,g\,NH_3$

6) What is the molar mass of MgO?

$24.31\,g\,Mg$
$+ 16.00\,g\,O$

$40.31\,g\,MgO$

g/mol

7) How are the terms "molar mass" and "atomic mass" different from one another?

g/mol

Mass of a mole of something - atom, compound

Mass of an individual atom

amus

8) Which is a better unit for expressing molar mass, "amu" or "grams/mole"?

g/mol

chapter 11 work sheet 1

1. How many molecules are contained in each of the following?

a. 1.35 mol carbon disulfide (CS_2)
b. 0.254 mol diarsenic trioxide (As_2O_3)

2. How many moles contain each of the following?

a. 1.25×10^{15} molecules carbon dioxide
b. 3.59×10^{21} formula units sodium nitrate

3. How many moles are in 100.0 g of each of the following compounds?

a. dinitrogen oxide (N_2O)
b. methanol (CH_3OH)

4. Make the following conversions.

a. 3.50 mol Li to g Li
b. 7.65 g Co to mol Co

5. How many moles of ions are in the following?

a. 0.0200 g $AgNO_3$ **c.** 0.500 g $Ba(OH)_2$
b. 0.100 mol K_2CrO_4

1a.

$$1.35\,mol\ CS_2 \times \frac{6.02\times10^{23}\ molec.}{1\,mol\ CS_2} =$$

$$8.13\times10^{23}\ molec\ CS_2$$

b.

$$0.254\,mol\ As_2O_3 \times \frac{6.02\times10^{23}\ molec.}{1\,mol\ As_2O_3} =$$

$$1.53\times10^{23}\ molec\ As_2O_3$$

2a.

$$1.25\times10^{15}\ molec.\ CO_2 \times \frac{1\,mol\ CO_2}{6.02\times10^{23}\ molec.} =$$

$$2.08\times10^{-9}\ mol\ CO_2$$

b.

$$3.59\times10^{21}\ f.u.\ NaNO_3 \times \frac{1\,mol\ NaNO_3}{6.02\times10^{23}\ f.u.} =$$

$$5.96\times10^{-3}\ mol\ NaNO_3$$

3 a. $\dfrac{2(14.00\text{g})\ N \quad 16.00\text{g}\ O}{44.0\ \frac{\text{g}}{\text{mol}}\ N_2O}$

$100.0\text{g}\ N_2O \times \dfrac{1\text{mol}\ N_2O}{44.0\text{g}} = 2.27\text{mol}\ N_2O$

b. $\dfrac{12.01\text{g}\ C \quad 4(1.01\text{g})\ H \quad 16.00\text{g}\ O}{32.05\ \frac{\text{g}}{\text{mol}}\ CH_3OH}$

$100.0\text{g}\ CH_3OH \times \dfrac{1\text{mol}\ CH_3OH}{32.05\text{g}} =$

$3.13\text{mol}\ CH_3OH$

4) a. $3.50 \text{ mol Li} \times \frac{6.941 \text{ g Li}}{1 \text{ mol Li}} = 24.3 \text{ g Li}$

b. $7.65 \text{ g Co} \times \frac{1 \text{ mol Co}}{58.933 \text{ g}} = 0.130 \text{ g Co}$

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5) a. $0.0200 \text{ g } AgNO_3 \times \frac{1 \text{ mol } AgNO_3}{169.87 \text{ g}} \times \frac{2 \text{ mol ions}}{1 \text{ mol } AgNO_3} = 2.35 \times 10^{-4} \text{ mol ions}$

b. $0.100 \text{ mol } K_2CrO_4 \times \frac{3 \text{ mol ions}}{1 \text{ mol } K_2CrO_4} =$

0.300 mol ions

c. $0.500 \text{ g } Ba(OH)_2 \times \frac{1 \text{ mol } Ba(OH)_2}{171.33 \text{ g}} \times \frac{3 \text{ mol ions}}{1 \text{ mol } Ba(OH)_2} = 8.75 \times 10^{-3} \text{ mol ions}$

Percent Composition Worksheet - Solutions

Find the percent compositions of all of the elements in the following compounds:

1) $CuBr_2$

Cu:

Br:

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2) NaOH

Na:

O:

H:

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3) $(NH_4)_2S$

N:

H:

S:

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4) N_2S_2

N:

S:

Percent Composition Worksheet - Solutions

Find the percent compositions of all of the elements in the following compounds:

1) $CuBr_2$

Cu - 63.55 g/mol

2Br - 2(79.9 g/mol)

$CuBr_2$ — 223.4 g/mol

$\frac{63.55}{223.5} \times 100 = 28.4\%$

$\frac{2(79.9)}{223.4} \times 100$

Cu: 28.4%

Br: 71.6%

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2) NaOH

Na 23 g/mol

O 16 g/mol

H 1 g/mol

40 g/mol

$\%Na = \frac{23}{40} \times 100 = 57.5$

$\%O = \frac{16}{40} \times 100 =$

$\%H = \frac{1}{40} \times 100 =$

Na: 57.5%

O: 40.0%

H: 2.5%

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3) $(NH_4)_2S$

N 2(14)

H 8(1)

S 32

68 g/mol

$\frac{28}{68} \times 100 =$

$\frac{8}{68} \times 100 =$

$\frac{32}{68} \times 100 =$

N: 41.1%

H: 11.8%

S: 47.1%

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4) N_2S_2

N 2(14 g)

S 2(32 g)

92 g/mol

$\frac{28}{92} \times 100 =$

$\frac{64}{92} \times 100 =$

N: 30.4%

S: 69.6%

work sheet #2

Name

1. 2-Methylpropene is a compound used to make synthetic rubber. A sample of 2-methylpropene contains 0.556 g C and 0.0933 g H. Determine its empirical formula.

2. Benzoic acid is a compound used as a food preservative. The compound contains 68.8% C, 4.95% H, and 26.2% O by mass. What is its empirical formula?

3. Freons are gaseous compounds used in refrigeration. A particular Freon contains 9.93% carbon, 58.6% chlorine, and 31.4% fluorine by mass. What is the empirical formula of this Freon?

4. The molecular mass of benzene, an important industrial solvent, is 78.0 u and its empirical formula is CH. What is the molecular formula for benzene? Benzene is a proven carcinogen.

5. Aspirin contains 60.0% carbon, 4.48% hydrogen, and 35.5% oxygen. It has a molecular mass of 180 u. What are its empirical and molecular formulas?

1) $0.556\,g\,C \times \frac{1\,mol\,C}{12.01\,g} = \frac{.0463\,mol\,C}{.0463} = 1$

$0.0933\,g\,H \times \frac{1\,mol\,H}{1.01\,g} = \frac{.0923\,mol\,H}{.0463} = 2$

CH_2

2) 68.8 % C : 68.8 g C

4.95 % H : 4.95 g H

26.2 % O : 26.2 g O

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100 g sample

$$68.8\,g\,C \times \frac{1\,mol\,C}{12.01\,g} = \frac{5.73\,mol\,C}{1.64} = 3.5 \times 2 = 7$$

$$4.95\,g\,H \times \frac{1\,mol\,H}{1.01\,g} = \frac{4.91\,mol\,H}{1.64\,mol} = 3 \times 2 = 6$$

$$26.2\,g\,O \times \frac{1\,mol\,O}{16.00\,g} = \frac{1.64\,mol\,O}{1.64\,mol} = 1 \times 2 = 2$$

$C_7H_6O_2$

#3

9.93% C = 9.93 g C

58.6% Cl : 58.6 g Cl

31.4% F : 31.4 g F

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100 g sample

$$9.93\,g\,C \times \frac{1\,mol\,C}{12.01\,g} = \frac{0.827\,mol\,C}{0.827\,mol} = 1$$

$$58.6\,g\,Cl \times \frac{1\,mol\,Cl}{35.45\,g} = \frac{1.65\,mol\,Cl}{0.827\,mol} = 2$$

$$31.4\,g\,F \times \frac{1\,mol\,F}{19.00\,g} = \frac{1.65\,mol\,F}{0.827\,mol} = 2$$

$C Cl_2 F_2$

H_4 CH – Empirical Formula

$12u\ C$
$1u\ H$

$13u$ – Empirical mass

$\frac{78u}{13u} = 6$ – molecular mass

$6(CH) = C_6H_6$

#5)

60.0% C = 60.0g C

4.48% H = 4.48g H

35.5% O = 35.5g O

100g sample

$60.0\text{g C} \times \frac{1\text{mol C}}{12.01\text{g}} = \frac{4.99\text{mol C}}{2.21\text{ mol}} = 2.24 \times 4$

$4.48\text{g H} \times \frac{1\text{mol H}}{1.01\text{g}} = \frac{4.43\text{mol H}}{2.21\text{ mol}} = 2 \times 4$

$35.5\text{g O} \times \frac{1\text{mol O}}{16.00\text{g}} = \frac{2.21\text{ mol O}}{2.21\text{ mol}} = 1 \times 4$

$C_9H_8O_4$

$C_9H_8O_4$

9 (12g) C

8 (1g) H

4 (16g) O

180g — Empirical mass

$\frac{180}{180} = 1$